

BREAST ULTRASOUND

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內容

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- GENERAL CONSIDERATIONS
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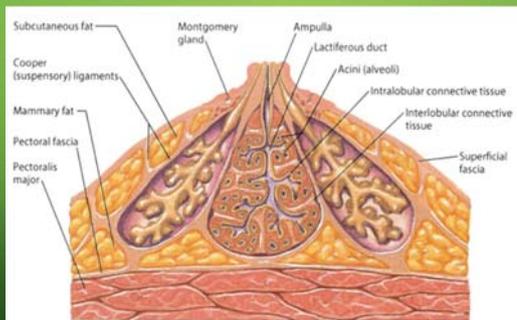
NORMAL SONOGRAPHIC BREAST ANATOMY

- 1.皮膚(Skin)
- 2.皮下脂肪(Subcutaneous fat)
- 3.Cooper氏韌帶(Cooper's ligaments)
- 4.乳房實質構造(Breast parenchyma)
- 5.乳房後脂肪(Retromammary fat)
- 6.胸肌(Pectoralis muscle)

NORMAL SONOGRAPHIC BREAST ANATOMY

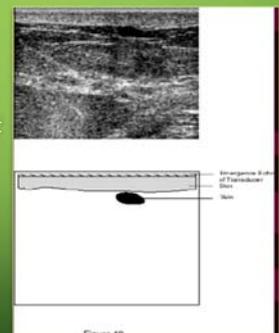
- 7.肋骨(Ribs)
- 8.胸膜(Pleura)

NORMAL SONOGRAPHIC BREAST ANATOMY



皮膚(SKIN)

- 正常厚度是2-3mm
- 位在超音波影像的最上層(最表層)



皮下脂肪 (SUBCUTANEOUS FAT)

- 位在皮膚與乳房實質構造之間
- 脂肪分布量多寡將因人而異
- 均質性影像

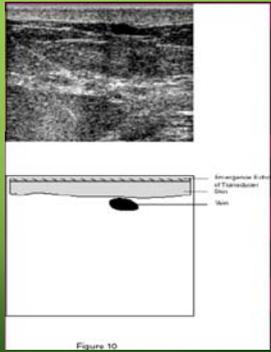


Figure 10

COOPER氏韌帶 (COOPER'S LIGAMENTS)

- 從乳房實質結構向上分布
- 高回音

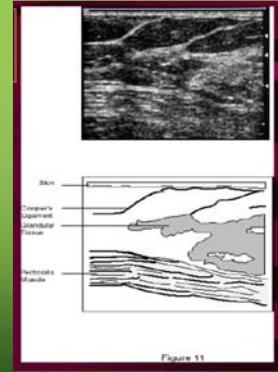


Figure 11

乳房實質構造 (BREAST PARENCHYMA)

- 位在皮下脂肪之下
- 呈現不均質 (mixed homogeneity) 的回音, 類似起司的結構
- 四種型態: fibrous
 - premenstrual
 - postmenstrual
 - pregnant

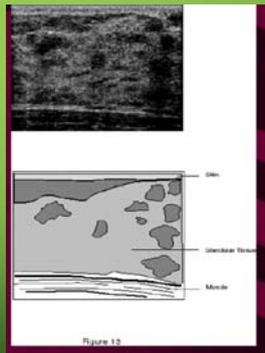


Figure 12

乳房後脂肪 (RETROMAMMARY FAT)

- 位在乳房實質構造之下方
- 將深層筋膜與胸肌分隔

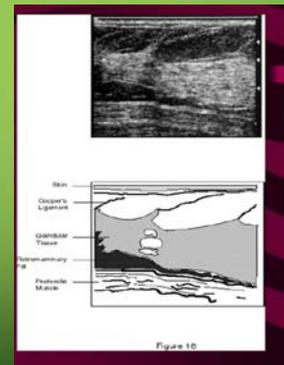


Figure 13

胸肌 (PECTORALIS MUSCLE)

- 位在肋骨之上

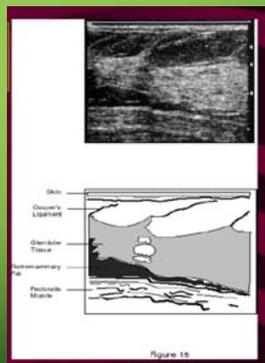


Figure 14

肋骨 (RIBS)

- 因為是骨質結構, 將造成 "acoustic shadow"

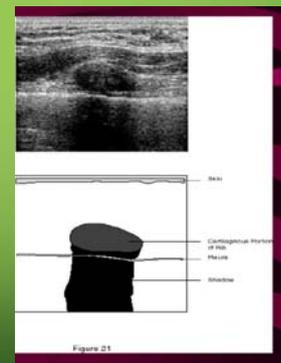
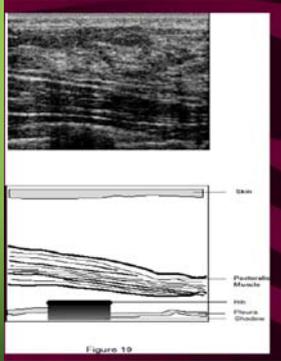


Figure 15

胸膜(PLEURA)

-位在肋骨之下,為一線性高回音之結構

-將隨呼吸而跟著移動位置



乳頭(NIPPLE)

• 乳頭及乳暈下可見“acoustic shadow”

• “acoustic shadow”形成原因:乳頭緻密的結締組織及一部分包覆在輸乳管旁的結締組織

• 正常乳頭表現:突出的,平坦的,內凹的

• 要辨別乳頭是否異常,可以對側乳房來做區別

乳頭及乳暈(NIPPLE AND AREOLA)

-若想清楚表現乳頭及乳暈之結構,可擠一層厚厚的gel,或者使用offset pad

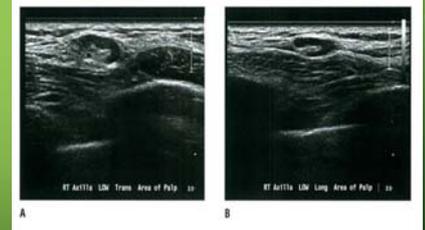
-乳房的皮膚厚度一般約是0.2cm,但乳下皺褶及乳暈區的皮膚會較厚一些



腋下(AXILLA)

-腋下區塊包含了淋巴結,臂神經叢,腋下動脈及靜脈

-正常的腋下淋巴結與乳房內淋巴結的表現:hilum為充滿脂肪的高回音結構,而皮質部分則為低回音至無回音



GENERAL CONSIDERATIONS

• Image quality

-依據2011年ACR對乳房超音波檢查practice guideline:中心頻率至少為10MHz的寬頻現性排列之探頭

-若遇到大胸部之病人,則選擇較低頻之探頭以評估其深層乳房組織

IMAGE QUALITY



Figure 9 — IMAGE QUALITY: TRANSDUCER FREQUENCY The image obtained with a linear transducer whose frequency range is 12-5 MHz is diagnostic (a) but greatly improved with a transducer whose frequency range is 17-5 MHz (b). In both images, the microcalcifications present within ducts (arrows) in the echogenic fibroglandular zone of tissue can be seen, but resolution of these particles and the ductal anatomy is better with the higher frequency probe.

IMAGE QUALITY

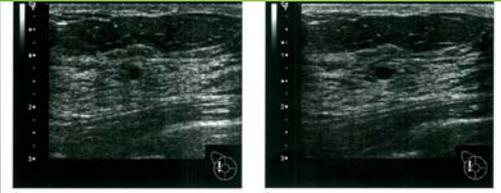


Figure 11 — IMAGE QUALITY EFFECTS OF HIGHER FREQUENCY AND COMPRESSION. (A) Oval mass in sagittal view has indistinct margins at 7.5 MHz (linear transducer frequency range 3.7–7 MHz). Diagnosis of simple cyst cannot be made, and the patient would most likely have undergone aspiration. Same mass (B) imaged with same transducer but operating at 14 MHz is identifiable as a simple cyst. Additional compression of the tissue with the probe helps to reduce refraction shadowing that is prominent in image (A). Improved image quality in (B) allowed BI-RADS® assessment as benign (category 2).

FIELD OF VIEW

-FOV:由組織的深度來決定,是指螢幕上所呈現超音波影像之大小

-FOV設定:

- 1.當進行乳房超音波掃描以找尋異常病灶時,FOV的深度須包含乳房組織與胸肌
- 2.一旦發現異常處,在調整FOV至較淺處,以放大病灶並仔細掃描

FIELD OF VIEW



Figure 12 — IMAGE QUALITY FOV: Single view of the left breast at 6.00 with breast tissue occupying only 50% of the FOV. From a depth of 2–4 cm, there is no information related to the breast. The focal zones (marked by **11** icons) are also set too deeply.

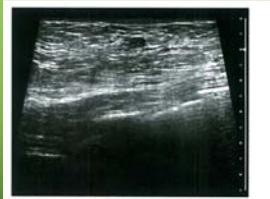


Figure 13 — IMAGE QUALITY FOV: The lower portion of this trapezoidal image contains no information. Small, 0.4 × 0.3 cm, mass located 0.8 cm deep from the skin is poorly visualized in this sonogram set to a depth of 5.5 cm. Image appears modified.

FIELD OF VIEW

-larger lesions:

- Extended field-of-view imaging, panoramic imaging, wide FOV sweep
- Dual screens
- Trapezoidal acquisition
- Volumetric acquisition; 3-D image

-以更大FOV來完整呈現整個病灶,抑或來了解病灶與周邊組織或乳頭的關聯性

EXTENDED FOV IMAGING



Figure 16 — IMAGE QUALITY: EXTENDED FOV. Complex cystic and solid mass shown in its entirety is a papillary ductal carcinoma in situ (DCIS).

DUAL SCREENS



TRAPEZOIDAL ACQUISITION

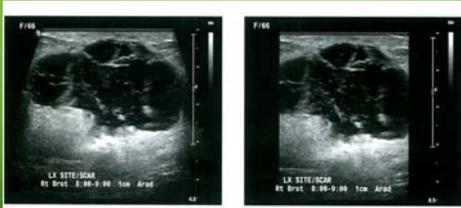


Figure 18 — IMAGE QUALITY: TRAPEZOIDAL ACQUISITION. Postsurgical fluid accumulation following lumpectomy for an invasive ductal carcinoma. Lateral aspects of this large collection are cut off on the rectangular image (A) but included in the wider base of the trapezoidal acquisition (B).

VOLUMETRIC ACQUISITION

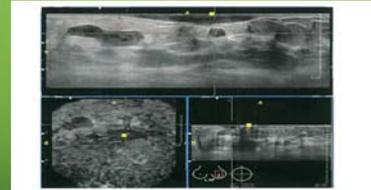


Figure 20 — IMAGE QUALITY: WIDE FOCUS VOLUMETRIC ACQUISITION. Images of the right breast at 12:00 in a 29-year-old woman with chronic, bilateral abscesses. Wide FOV B-mode transverse acquisition is illustrated above with coronal (lower left) and sagittal (lower right) images. The yellow square indicates location of the nipple, and the crosshairs are placed over a purulent collection shown in three orthogonal planes. Histopathology: granulomatous mastitis.

FOCAL ZONE

- focal zone的設定:皮膚層與胸肌的前中1/3的區塊
- 發現異常病灶:再重新調整focal zone至病灶的中心處

FOCAL ZONE

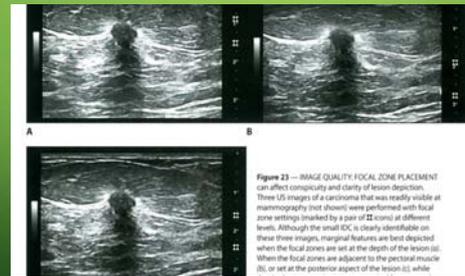


Figure 23 — IMAGE QUALITY: FOCAL ZONE PLACEMENT can affect conspicuity and clarity of lesion depiction. Three US images of a carcinoma that was readily visible at mammography (not shown) were performed with focal zone settings (marked by a pair of \square icons) at different levels. Although the small DC is clearly identifiable on these three images, marginal features are best depicted when the focal zones are set at the depth of the lesion (A). When the focal zones are adjacent to the pectoral muscle (B) or set at the anterior aspect of the lesion (C), while

GRAY SCALE GAIN

-灰階設定最佳化:皮下脂肪的灰階應在中間位置,為中等灰,而非黑色

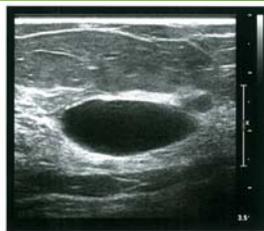
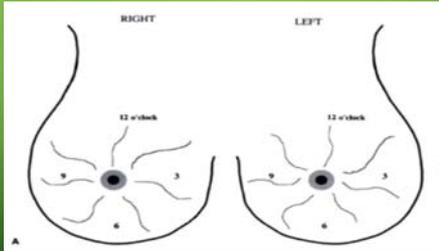


Figure 24 — IMAGE QUALITY: GRAY SCALE GAIN. Mass imaged with appropriate gain settings allows criteria for simple cyst to be applied. The center of the cyst appears anechoic, and surrounding fat and parenchyma are distinguished by the different shades of gray in this well-modulated image. A small complicated cyst is seen at the right margin of and anterior to the larger simple cyst.

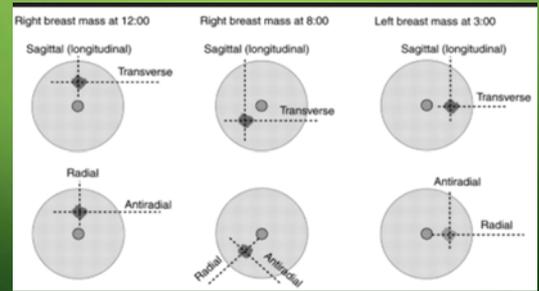
LABELING

1. Facility name and location
2. Examination date
3. Patient's first and last name
4. Identifying number and/or date of birth
5. Designation of right or left breast
6. Anatomic location using clock-face notation (to the nearest hour) or a labeled diagram of the breast
7. Transducer orientation (e.g., radial, antiradial, oblique, transverse, sagittal)
8. Distance from the nipple to the abnormality or the area being scanned in centimeters (measure from the nipple as a standard reference point, not the edge of the very variable areola)
9. Sonographer's and/or physician's identification number, initials, or other symbol

CLOCK-FACE NOTATION

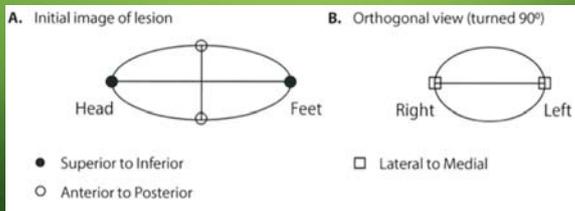


TRANSDUCER ORIENTATION

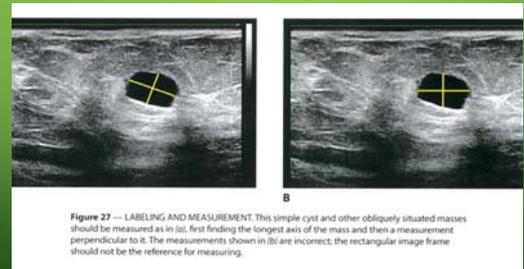


MEASUREMENT

-操作者須找到病灶的最長軸,並測量與最長軸垂直相交的兩平面距離



MEASUREMENT



MEASUREMENT

-距離單位可使用mm或cm來表示,但報告中需前後一致

MEASUREMENT

-若是多個水囊,我們可只測量最大的一顆,並只測量其最長軸
-獨立,無症狀,單一出現的水囊,可測量最長軸或不記錄

ACR-BIRADS

- ACR-BIRADS: American College of Radiology, breast imaging reporting and data system

TISSUE COMPOSITION (SCREENING ONLY)

- a. Homogenous background echotexture-fat
- b. Homogenous background echotexture-fibroglanular
- c. Heterogenous background echotexture

HOMOGENOUS BACKGROUND

ECHOTEXTURE-FAT



ECHOTEXTURE-FIBROGLANDULAR



HOMOGENOUS BACKGROUND

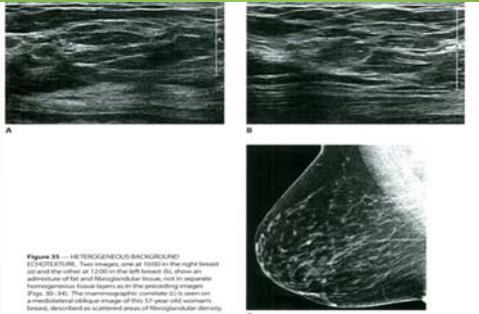
ECHOTEXTURE-FAT



ECHOTEXTURE-FIBROGLANDULAR



HETEROGENOUS BACKGROUND ECHOTEXTURE



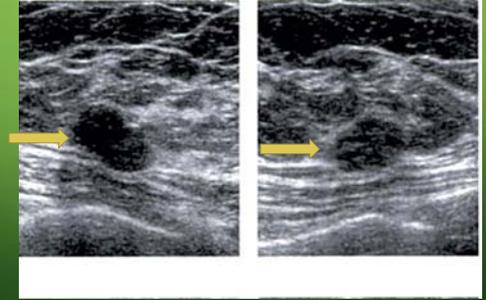
HETEROGENOUS BACKGROUND ECHOTEXTURE

- 因為背景雜亂,可能會影響乳房超音波對病灶偵測的敏感度
- 在脂肪與乳房實質交界處可能有shadow產生
- 通常發生在較年輕的乳房,或是mammography中呈現緻密型乳房之病人

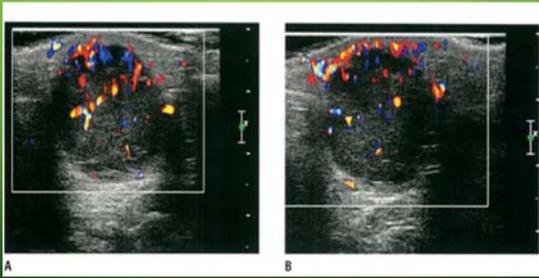
MASS-SHAPE

- Oval(卵圓形)—elliptical or egg shape, may include 2~3 lobulations (gently lobulated or macrolobulated)
- Round(圓形)—spherical, ball shaped, circular; circular in perpendicular projections
- Irregular(不規則形)—neither oval or round

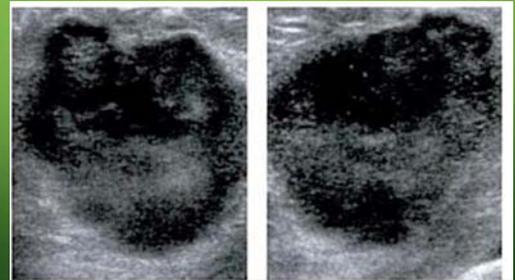
OVAL(卵圓形)



ROUND(圓形)



IRREGULAR(不規則形)



MASS-ORIENTATION

- -以mass與皮膚表面來做定義:
 - parallel(平行)
 - not parallel(非平行)

MASS-ORIENTATION

- -parallel(平行)
- Mass長軸平行皮膚面,大都屬良性瘤,除了mucinous 及 medullary carcinoma
- -not parallel(非平行)
- Mass長軸垂直皮膚面,cancer

MASS-ORIENTATION

-PARALLEL(平行)



-NOT PARALLEL(非平行)



MASS-MARGIN

• -margin:病灶的邊緣表現:

circumscribed(界線清楚)

Not- circumscribed(界線不清楚)

CIRCUMSCRIBED(界線清楚)

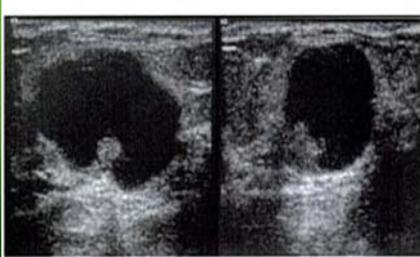


Fig. 3.13a, b Margin—circumscribed. The margin of this intracystic papillary carcinoma is sharply defined at the interface of the cyst with the surrounding tissue. In a, the mass is pedunculated; in the orthogonal view (b), the lesion is sessile in the dependent position of the cyst. Sharp marginal definition of the small carcinoma within the cyst is explained by growth of this mass within fluid. With permission from ACR BI-RADS, 4th ed., 2003.

NOT- CIRCUMSCRIBED(界線不清楚)

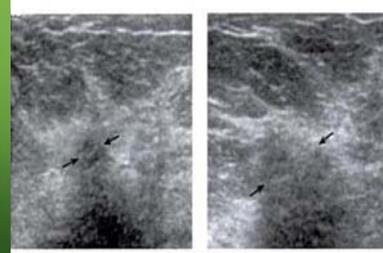


Fig. 3.14a, b Margin—not circumscribed: Indistinct. This hypoechoic invasive ductal carcinoma (arrows) has an irregular shape and indistinct margins. It is infiltrating the surrounding breast parenchyma. Associated architectural distortion is manifested by destruction of tissue planes. With permission from ACR BI-RADS, 4th ed., 2003.

MASS-ECHO PATTERN

• -echo pattern:是指mass內部的回音表現,是與皮下脂肪組織來相比較

- **Complex cystic and solid**- complex mass containing both anechoic (cystic) and echogenic (solid) components
- **Anechoic**-without internal echoes
- **Hypoechoic**-less echogenic than fat
- **Isoechoic**-
- **Hyperechoic**-increased echogenicity relative to fat or equal to fibroglandular tissue
- **Heterogeneous**-a mixture of echogenic patterns within a solid mass

COMPLEX CYSTIC AND SOLID

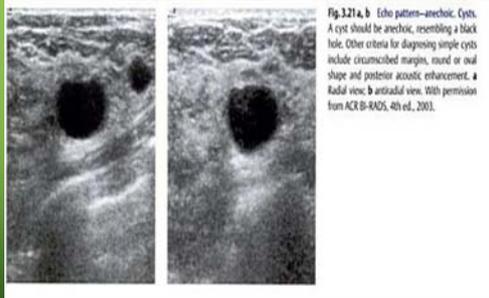
Mass 內同時含有水囊與固體的成分



Fig. 3.23 Echo pattern—complex. Intracystic carcinoma. An echogenic focus is present in the dependent portion of the cyst. Diagnosis is intracystic papillary carcinoma, less common than an intracystic papilloma. These masses are not distinguishable with ultrasound, and a clot might have a similar appearance. With permission from ACR BI-RADS, 4th ed., 2003.

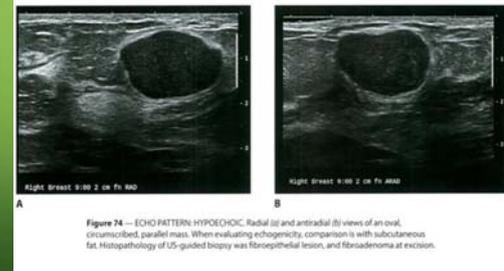
ANECHOIC

Mass內部無回音



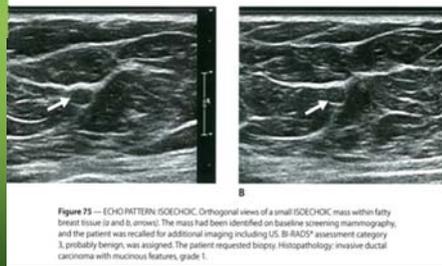
HYPOECHOIC

Mass內部回音比皮下脂肪略低一些



ISOECHOIC

Mass內部回音與皮下脂肪一致



HYPERECHOIC

Mass內部回音比皮下脂肪高一些或只是與乳腺的回音相同



HETEROGENOUS

Mass內部回音呈現異質回音



Figure 77 — ECHO PATTERN: HETEROGENEOUS. This palpable, painful new mass in a 75-year-old woman is circumscribed, oval, and parallel to the skin, with HETEROGENEOUS echotexture. Primarily because this solid mass was new, in an elderly woman, it was assessed as suspicious (category 4). Histopathology: low-grade mesenchymal tumor with periductal stromal proliferation and myxoid changes.

MASS-POSTERIOR FEATURES

- -Posterior features: 是為了表現出音波穿透mass後的衰減情況
 - a. No posterior features
 - b. Enhancement
 - c. Shadowing
 - d. Combined

NO POSTERIOR FEATURES

代表mass後方區域與相同深度的鄰近組織區域回音都是一致的

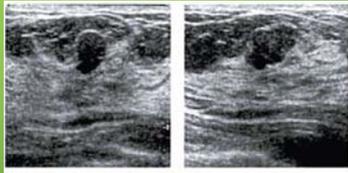


Fig. 3.26 A, B Posterior acoustic features—none. Compared with tissue at the same depth, orthogonal views show no difference in echogenicity deep to the mass. The mass has an irregular shape and microlobulated margins that are not circumferential. Posterior features are less important than margin and shape. Histology: atypical ductal hyperplasia, fibroadenoma, and stromal fibrosis. With permission from ACR BI-RADS, 4th ed., 2003.

ENHANCEMENT

Mass後方區域出現了柱狀回音加強之結構。通常其mass會被判定為cyst, 但有時均質的固體病上也可能有這種情形



Figure 83 — POSTERIOR FEATURES ENHANCEMENT Papillary mass in a 28-year-old woman has an irregular shape (A) and a well-circumferential indistinct margin. The mass has strong POSTERIOR ENHANCEMENT. Assessment is suspicious — high suspicion category 4C. Histopathology: Invasive ductal carcinoma, grade 3.

SHADOWING

-Mass後方區域出現了黑色陰影之情形, 通常代表mass有纖維化, 也可能表示mass可能是 carcinoma.
-術後的疤痕, 乳房纖維化, 癌症促使結締組織增生



Figure 84 — POSTERIOR FEATURES SHADOWING Irregular, hypoechoic mass with a spiculated, indistinct and irregular margin, with POSTERIOR SHADOWING in a 39-year-old woman. Histopathology: Invasive ductal carcinoma.

COMBINED



Figure 87 — POSTERIOR FEATURES COMBINED (ART 1036) Shadowing (A) and enhancement (B) are shown in (B), the anterior view of the papillary, oval, circumferential, complex cystic and solid mass containing calcifications (arrow), in a 47-year-old woman. The tangential view (C), in which the mass is imaged axially, shadowing is less conspicuous than enhancement. Angle of inspection and compression force of the probe against the tissue can also affect depiction of posterior features. Histopathology of core biopsy specimens: Microglandular breast.

CALCIFICATION

外型

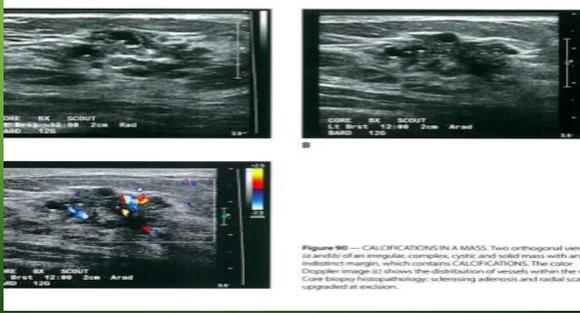
- microcalcifications: 高回音小斑點, 且無形成 shadow
- macro, coarse calcifications 或有形成 shadow 的 microcalcifications

CALCIFICATION

位置

- Calcifications in a mass
- Calcifications outside of a mass
- Intraductal calcifications

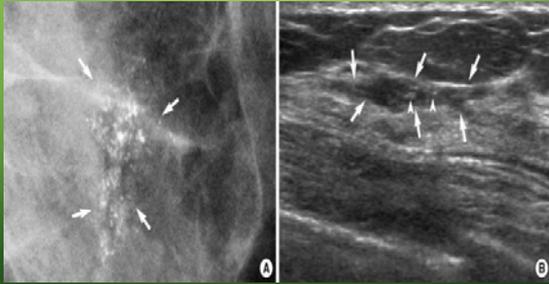
CALCIFICATIONS IN A MASS



CALCIFICATIONS OUTSIDE OF A MASS



INTRADUCTAL CALCIFICATIONS



ASSOCIATED FEATURES

1. 結構變形
2. 乳管改變
3. 水腫
4. 皮膚改變

THANKS FOR YOUR ATTENTION!!!

